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ABSTRACT

The purpose of this study was to investigate, with underprivileged first-grade children, the efficacy of the Initial Teaching Alphabet (i.t.a.) in teaching beginning reading and of the Peabody Language Development Kit (PLDK) in stimulating oral language and verbal intelligence. From 17 classes in nine schools, four groups, consisting of 100, 104, 84, and 81 subjects, were formed. Samples of 54 subjects each were drawn from these groups; subjects in each group were comparable in chronclogical age, sex, IQ, number of members in the family, type of housing, level of education of the most-educated parent, and race. The experimental programs were begun in September after the subjects were pretested. Both the PLDK and the i.t.a. were taught by the regular classroom teachers in self-contained classes. Pupil progress was measured in three areas: school achievement, language develcpment, and intellectual growth. From the results it was concluded that i.t.a. clearly enhances beginning reading skills, especially in word attack, and that the PLDK does raise the IQ and improve overall oral language facility as well as reading skills for disadvantaged boys. (TS)

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The Efficacy of the Initial Teaching Alphabet and the Peabody Language Development Kit with Grade One Disadvantaged Children: After One Year[1]

By

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An adequate education is a vital foundation for children of working-class families if they are to improve their socio-economic status. Yet traditionally these children have had difficulty in meeting the demands of the school with its middle-class orientation. Thus, perhaps the greatest challenge facing our school

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[1]The research reported herein was supported by grant HD973 from the National Institute of Child Health and Human Development, and from Ford Foundation funds through the Nashville Education Improvement Project. This experiment was carried out in collaboration with the Nashville Metropolitan Schools. Recognition is due the many teachers and administrators who assisted in this research, particularly M. D. Neely and Carrie Denney who coordinated the program within the school system.

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systems today is to develop improved methods of teaching the educationally disadvantaged so as to enable them to achieve at a level more in line with the expectations of the system. This article reports on an evaluation of the effects of two educational techniques on the abilities of a group of deprived first grade children.

No doubt there is a need for innovation and experimentation in all areas of instruction. However, it can be argued that language is an especially critical aspect. By middle-class standards, both poor Southern Negro and Caucasian children come from home and community environments that are impoverished and very different linguistically. Spearheaded by the research of such Soviet scientists as Vygotsky, Pavlov, and Luria, (1961), we have come to recognize increasingly the central role of language in human endeavor. It has a threefold function: (1) a means of communication, (2) an instrument for thought, and (3) a method for regulating behavior. Thus, with increased language facility, the disadvantaged would have a foundation for better communication, for improved intellectual functioning, and for the acquisition of more knowledge. For this reason, it was decided to study the efficacy of two new approaches to language development with children entering school who are already retarded in verbal intelligence and oral language proficiency. The findings reported herein constitute a report at the completion of one year of an instructional program which is planned to extend over three years, with an additional follow-up period of three years. The research reported in this article is part of a larger investigation reported in monograph form (Dunn and Mueller, 1966), which contains more complete information regarding the materials and procedures used in this study.

Purpose

The purpose of this study was to investigate, with underprivileged first grade children, the efficacy of: (1) the Initial Teaching Alphabet (ITA) in

teaching beginning reading, and (2) the Peabody Language Development Kit (PLDK) in stimulating oral language and verbal intelligence.

It was predicted that: (1) use of ITA alone in beginning reading instruction would enhance reading ability; (2) the use of the PLDK alone would raise the intelligence quotients (IQ's) of the children while, at the same time, enhancing their oral language development and school achievement, and (3) the ITA plus the PLDK in combination would be even more effective in fostering verbal intelligence, language development, and school achievement.

Treatments

Two major adaptations were made in the regular first grade curriculum. The first involved the Initial Teaching Alphabet and the second the Peabody Language Development Kit.

Initial Teaching Alphabet

Beginning reading instruction with experimental children was carried out using the Early-to-read Series developed by Mazurkiewicz and Tanyzer (1963). This series consists of eight textbooks and five workbooks designed to carry the child from a point of beginning reading in ITA through the transition to traditional orthography (TO) at the high third grade level. In contrast to the Downing Readers series from England which utilizes a sight vocabulary approach, the Mazurkiewicz and Tanyzer program is based on the premise that the children should first learn the individual sound symbols before being taught to synthesize them into words, sentences, paragraphs, and stories. Thus a phonetic rather than a sight vocabulary approach is used.

None of the experimental teachers had used ITA before. They participated in a three-day workshop prior to the opening of school and then were encouraged to follow the reading program in a fairly standard manner. All teachers tended to stress learning of sound symbols in isolation and in key words. Some variability

occurred in the extent to which the teachers used experience charts, labels for objects in the rooms, and the bulletin board to give children added experiences to create a familiarity with the ITA system. A small collection of supplementary reading materials in ITA was also used, including a set of the Downing Readers in each classroom, as well as books in traditional orthography. (The controls used the Houghton-Mifflin basic reading series).

Peabody Language Development Kit

An experimental edition of Level #1 PLDK designed by Dunn and Smith (1965) was used in the study reported herein. The lessons were intended to stimulate oral language and verbal intelligence, and therefore to enhance school progress. Figure 1 outlines a model of the psycholinguistic processes trained by the lessons.

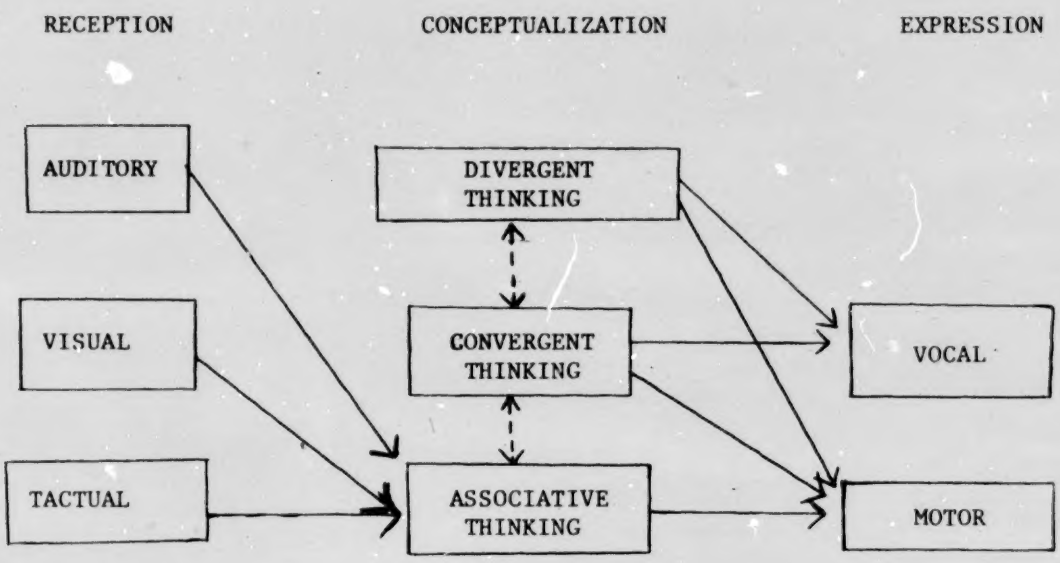

Fig. 1 Model of the Psycholinguistic Processes Trained by the Peabody Language Development Lessons

Included in the experimental edition were 200 detailed, 35 to 45 minute, daily lesson plans, each containing two to four activities from among 23 different categories. Typical were: brainstorming, classification, conversation, critical thinking, describing, imagination, listening, memory, pantomiming, relationships, and vocabulary building. Included, as well, were over 400 picture cards, a supply of color cards, a hand puppet. a tape recorder, and a manual.[3]

The lessons were designed for children who were functioning intellectually from the 4-1/2 to the 6-1/2 year age level. The philosophy of the PLDK is that Language Time should be a half hour interlude from conventional school work. Though early lessons required considerable teacher participation, the overall goal was to maximize the oral language behavior of the pupils, giving them an opportunity to talk, to think, and to learn effectively in a setting that was less structured than during a regular period of school work. The children were never called on either to read or write. In fact, no seat work was involved. The total group participated together, the emphasis being on thinking as well as on talking and understanding conventional English speech.

Groups

Three experimental groups and one control group were established. Group 1 received ITA only; group 2 received ITA plus PLDK; and group 3 PLDK only. These three experimental groups consisted of four classes each--a pair at each of three schools. Thus six experimental schools were involved. Group 4 was a control group drawn from five schools in the same community. All schools, experimental and control, served children residing in urban slums.

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[3]A revised version of Level #1 PLDK is available from the American Guidance Service, Inc., 720 Washington Avenue, SE, Minneapolis, Minnesota.

Subjects

Pupils

A total group of approximately 1,000 experimental and 150 control subjects were initially selected to take part in the program. The subject pool consisted of 732 of these subjects on whom complete test data were obtained.

Administrative considerations dictated that the various experimental treatments be carried out with all children enrolled in the classes involved. As a result, the groups were not comparable in size nor on such variables as intelligence quotients, mental ages, chronological ages, and language abilities. Therefore, a selected study sample was established by deleting subjects who did not meet criteria set up for culturally disadvantaged children, and then by randomly selecting equal size samples of boys and girls from each of the treatment groups. More specifically, children with IQ's above 110 and from adequate housing and socio-economic status were excluded. This reduced the number of subjects in the smallest group to 54 (27 boys and 27 girls). Therefore, subjects in the larger groups were randomly eliminated until the number in all four groups was equal at 54, giving a total study sample of 216. In each group of 54 subjects, 27 were boys and 27 were girls. Reference data on the study sample are presented in Table 1.

Analyses of variance (see Table 2) indicated that the resultant groups were comparable in terms of chronological age, IQ, mental age, and language age. Basic home information suggested that the level of education of the parent,[4] the number of members in the family, and the type of housing were comparable (see Table 3).

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[4]The level of education of the best educated parent was used.

Table 1

Basic Information on the Selected Study Samples

Variables	Total (n=216)	ITA (N=54)	ITA PLDK (n=54)	PLDK (n=54)	Control (n=54)
CA $\bar{X}$	76.08	74.04	75.54	79.85	74.91
SD	6.24	3.83	5.62	8.04	5.18
S-B IQ $\bar{X}$	84.55	85.18	85.35	82.70	84.94
SD	11.32	11.17	9.66	13.82	10.30
S-B MA $\bar{X}$	65.22	63.89	65.33	67.11	64.54
SD	8.04	7.60	6.61	10.44	6.76
PPVT MA $\bar{X}$	56.80	56.61	57.04	57.70	55.83
SD	14.60	13.23	14.03	17.92	13.04
ITPA LA $\bar{X}$	61.81	60.32	61.82	62.18	62.91
SD	8.08	7.71	7.36	9.51	8.35

TABLE 2

Analyses of Variance of Pre-Experiment Data Among Groups

Variable	Source of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	F Ratio*
	Between groups	7	1207.389	172.484	.085
	Within groups	208	421075.111	2024.399	
	Total	215	422282.500		
I.Q. (Binet)	Between groups	7	629.685	89.955	.695
	Within groups	208	26913.852	129.394	
	Total	215	27543.537		
M.A. (Binet)	Between groups	7	475.736	67.962	1.054
	Within groups	208	13413.037	64.486	
	Total	215	13888.773		
L.A. (ITPA)	Between groups	7	544.130	77.733	1.198
	Within groups	208	13489.703	64.854	
	Total	215	14033.833		

* F .95 = 2.06

Table 3

Basic Home and Family Information

GROUP	Average Number of Children per Family	Average Number of Adults per Family	Mean Educational Level of Parent*	Housing Conditions in Percentages			
				Extremely Poor	Moderately Poor	Fair	Good
Grand Total	5.0	1.9	10.1	22	42	36	--
ITA Total	4.5	1.9	10.7	25	38	37	--
Boys	3.8	2.0	10.2	27	46	27	--
Girls	5.1	1.8	11.3	23	31	46	--
ITA plus PLDK Total	4.5	1.7	10.2	25	46	29	--
Boys	4.4	2.2	10.7	33	37	30	--
Girls	4.6	1.3	9.7	16	56	28	--
PLDK Total	5.6	1.9	9.1	19	41	40	--
Boys	6.1	2.0	9.2	13	52	35	--
Girls	5.1	1.8	9.1	25	29	46	--
Control Total	4.3	2.1	10.4	18	43	39	--
Boys	4.0	2.2	10.7	22	45	33	--
Girls	4.6	2.0	10.2	15	40	45	--

*Level of education of the best educated parent

Teachers

Involved in the three ITA and PLDK treatments were a total of 12 teachers (four in each treatment) in a total of six schools--four serving essentially all Negro youth and two well-integrated with Negro and Causasian children. Eight of the teachers were Negro and four were Caucasian. Three of the five control schools served solely Negro children and two were integrated. All of the teachers, experimental and control, were grade one teachers with more than one year of experience in teaching, were fully certified in elementary education, and held one or more degrees.

The experimental teachers in this study were given a number of incentives not available to the control teachers. They were provided with a small supplementary stipend and were asked to attend in-service training sessions throughout the year, averaging approximately one every two weeks. As the year progressed, the emphasis of these sessions shifted from learning the experimental treatment to discussions of problems arising in connection with the program. The experimental teachers were provided other stimulation. Supplementary materials were purchased. They were frequently visited by the researchers, school officials, and other visitors, and were given considerable recognition by their principals. Twice during the year, a consultant from Bethlehem, Pa., who had taught in ITA previously, worked with the teachers. In turn, several teachers visited ITA classes in Bethelem. All experimental teachers had an opportunity to observe each other teach and to share ideas. Furthermore, they were paired up in schools so they could share informally together their innovations and problems. There was little doubt but what the teachers knew they were part of an experiment. Motivation to excellence in teaching was high. In contrast, the control teachers were not stimulated or supported in any way by the project. The children were simply tested at the beginning of the year and retested at the end of it. Thus, a very

important part of the experimental treatment was the added incentives provided the experimental teachers, and not the control teachers.

Evaluation

Test data were secured in three areas of development: school achievement, language development, and verbal intelligence.

School Achievement

Since the Metropolitan Achievement Test (MAT) was used throughout the Nashville Metropolitan Schools, being routinely administered at the end of each school year, it was chosen for measuring academic achievement. The Primary Battery 1 in traditional orthography[5] was used. It consists of four sub-tests: word knowledge (WK), word discrimination (WD), reading comprehension (R), and arithmetic (A). The achievement testing took place from late March to mid-May. Actual grade placement at time of test averaged about 1.75 (mid-April). Achievement tests were administered by the classroom teachers.

Language Development

Three measures of language ability were obtained on the children: the Illinois Test of Psycholinguistic Abilities, the Peabody Picture Vocabulary Test, and the Peabody Language Production Inventory. These were administered by psychologists and psychometric technicians. All examiners were checked out and supervised by the principal investigators.

The Illinois Test of Psycholinguistic Abilities (McCarthy and Kirk, 1963) was developed as an individual test of the psycholinguistic abilities of children between the ages of 2-1/2 and 9 years. It consists of nine subtests which measure two input channels (auditory and visual), two output channels (vocal and motor), and two levels of organization (representational and automatic-sequential). The

[5]The reading subtests of the Metropolitan Achievement Test were also administered in ITA. These data are available in the monograph (Dunn and Mueller, 1966).

nine subtests are: (1) auditory decoding, (2) visual decoding, (3) auditory-vocal-association, (4) visual-motor-association, (5) vocal encoding, (6) motor encoding, (7) auditory-vocal automatic, (8) auditory-vocal sequencing, and (9) visual-motor sequencing.

The Peabody Picture Vocabulary Test (PPVT) is an individually administered, single channel, instrument (Dunn, 1965), yielding a measure of hearing vocabulary (auditory decoding on the ITPA). The subject is required to indicate which one of four response pictures correctly depicts the meaning of a stimulus word presented orally by the examiner. There are 150 items in the test, graded in difficulty from the 2 to the 18 year levels. It is only necessary to administer the test over the critical range for an individual subject.

The Peabody Language Production Inventory (PLPI) is an unstandardized instrument developed expressly for use in this study. It is designed to measure the free speech of children through showing them a series of three pictures (a street scene, a good humor man scene, and an operating room scene), and asking them to tell a different story about each. The responses of the subjects are rated on three dimensions of performance: (a) level of abstraction (integrative story, description of action, description of content, enumeration of content), (b) structural complexity (use of paragraphs, sentences, phrases, or words only), and (c) general (speech volume, speech quality, and attitude toward the test).

Verbal Intelligence

The verbal intelligence of the children was measured by means of the 1960 revision of the Stanford-Binet (S-B). It was selected instead of such other individual intelligence tests as the Weschler Intelligence Scale for Children in that it has been demonstrated to be effective at the age and level of operation of the subjects used in the present study.

Results

Results of the investigation are reported for each of the three areas of functioning for which data were collected: school achievement, language development, and intelligence.

Grade equivalent scores derived from the MAT are presented in Table 4 for the total experimental sample and for the various sub-groups. Figure 2 presents the same data in graphic form. These data were submitted to analysis of variance in which subtest comparisons were treated as within group differences and other comparisons as between groups. The results of this analysis are reported in Table 5. Significant differences are noted on a number of these comparisons. The most important findings from the top half of Table 5 are : (1) the clear superiority of the ITA groups over those in the regular basic reader program, (2) the lack of differences between groups using PLDK and those not having this experience, and (3) the superior performance of the girls over the boys in overall school achievement. As the bottom half of Table 5 indicates, there was a significant difference among MAT subtest scores, accounted for by significantly high word discrimination, and significantly low arithmetic scores ("t" tests used). The significantly high mean score in word discrimination was accounted for almost exclusively by the ITA group (see graph and AD interaction). The confirming ABD interaction indicates that the ITA and PLDK in combination was significantly more effective in the reading areas than in arithmetic. As can be seen in Figure 2, the significant ABD interaction (line converging) was due to including the arithmetic subtest. The BCD interaction indicates that the PLDK was more effective for boys than girls in enhancing performance on the word discrimination tests. (See Figure 3).

Language performance was measured by testing with the ITPA, PPVT, and PLPI at both the beginning and end of the first experimental year. Pretest, post-test, and gain scores for each group on the language measures are present

TABLE 4

Means and Standard Deviations for School Achievement Data (Grade Equivalent Scores) as Measured by the Metropolitan Achievement Test in Traditional Orthography

Group		N		WK*	WD*	R*	A*
Total		216	$\bar{X}$	2.01	2.31	2.02	1.72
			SD	.54	.84	.60	.58
ITA	Total	54	$\bar{X}$	2.17	2.71	2.18	1.86
			SD	.54	.86	.61	.65
	Boys	27	$\bar{X}$	2.08	2.54	2.11	1.80
			SD	.56	.85	.61	.58
	Girls	27	$\bar{X}$	2.27	2.88	2.24	1.92
			SD	.52	.84	.62	.72
ITA plus PLDK	Total	54	$\bar{X}$	2.34	2.86	2.30	1.79
			SD	.57	.82	.69	.51
	Boys	27	$\bar{X}$	2.33	3.01	2.31	1.83
			SD	.61	.84	.76	.52
	Girls	27	$\bar{X}$	2.36	2.70	2.29	1.74
			SD	.54	.79	.63	.50
PLDK	Total	54	$\bar{X}$	1.75	1.81	1.78	1.69
			SD	.43	.57	.46	.64
	Boys	27	$\bar{X}$	1.73	1.76	1.65	1.62
			SD	.44	.57	.42	.63
	Girls	27	$\bar{X}$	1.77	1.86	1.90	1.77
			SD	.42	.58	.48	.66
Control	Total	54	$\bar{X}$	1.79	1.87	1.81	1.53
			SD	.11	.46	.40	.47
	Boys	27	$\bar{X}$	1.68	1.70	1.68	1.46
			SD	.27	.40	.30	.53
	Girls	27	$\bar{X}$	1.89	2.04	1.95	1.60
			SD	.40	.45	.45	.39

*WK--word knowledge; WD--word discrimination; R--reading comprehension; A--arithmetic

Table 5

Analysis of Variance on Metropolitan Achievement Test Scores

Source of Variation	Degree of Freedom	Sum of Squares	Mean Squares	F Ratio	Confidential Levels
A (ITA vs non ITA)	1	58.594	58.594	60.531**	
B (PLDK vs non PLDK)	1	.520	.520	.537	$F_{.95}=3.89$**
C (boys vs girls)	1	3.106	3.106	3.209*	$F_{.90}=2.73$*
AB interaction	1	.358	.358	.370	
AC interaction	1	1.055	1.055	1.090	
EC interaction	1	2.081	2.081	2.150	
ABC interaction	1	.464	.464	479	
Error (b)	208	201.240	.968		
Total variance between Ss	215	267.418			
D (sub test)	3	38.046	12.682	103.106**	$F_{.95}=2.60$**
AD interaction	3	15.238	5.079	41.293**	$F_{.90}=2.08$*
BD interaction	3	.020	.007	.057	
CD interaction	3	.175	.058	.472	
ABD interaction	3	1.845	.615	5.000**	
ACD interaction	3	.308	.103	.837	
BCD interaction	3	1.148	.383	3.114**	
ABCD interaction	3	.292	.097	.789	
Error	624	76.938	.123		
Total variance within Ss	648	134.010			
Total	863				

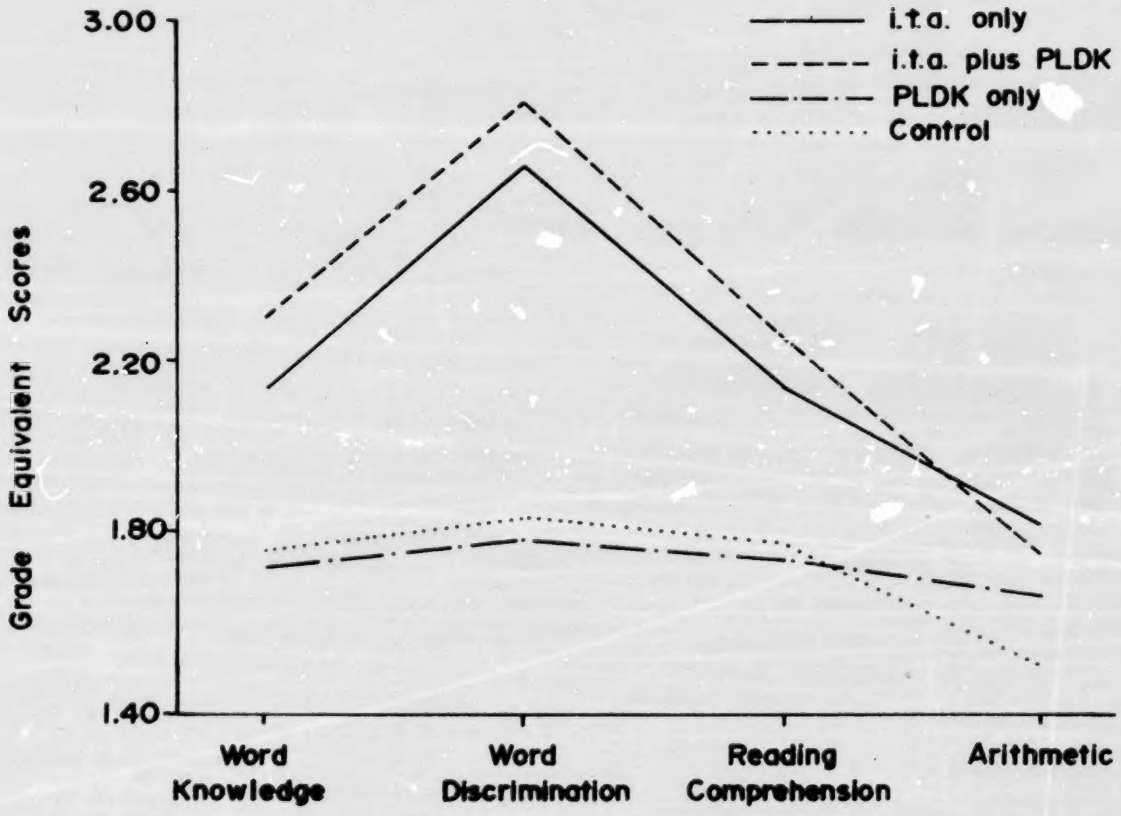

Fig. 2: Mean Metropolitan Achievement Test Scores of the Grade 1 Culturally Disadvantaged Children late in the School Year 1964-65.

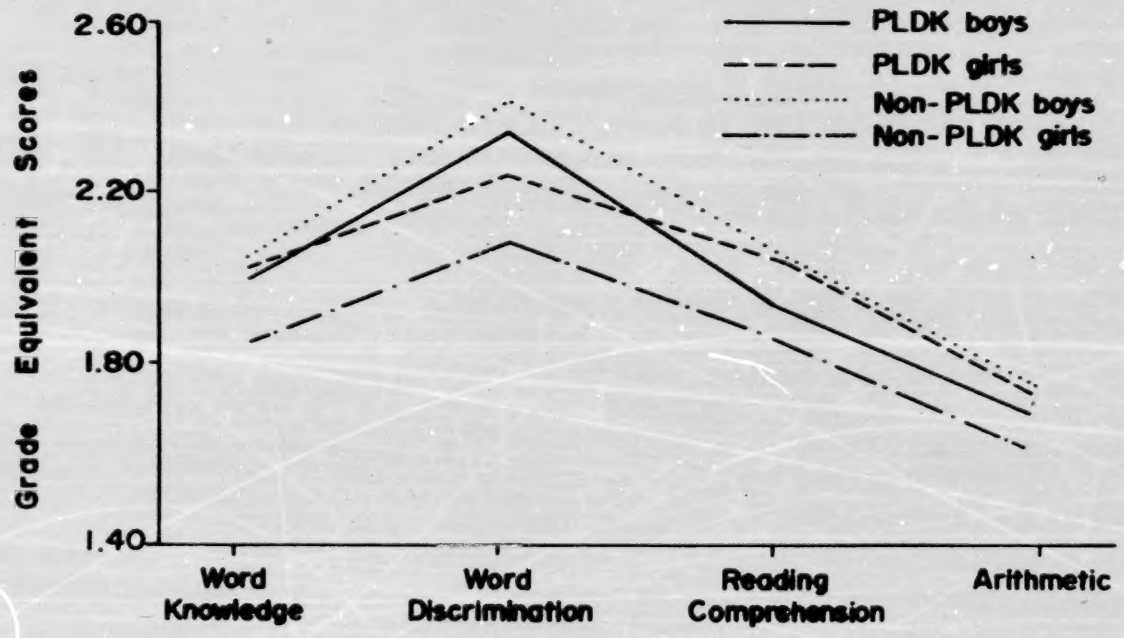

Fig. 3: Graphic Presentation of the Interaction effects between PLDK vs. non-PLDK, Sex and Sub Tests of the Metropolitan Achievement Test Scores.

Table 6

Means and Standard Deviations for Language Data

Group		N		ITPA (LA) Pretest	ITPA (LA) Posttest	ITPA (LA) Gain	PPVT (MA) Pretest	PPVT (MA) Posttest	PPVT (MA) Gain	PLPI (Raw Scores) Pretest	PLPI (Raw Scores) Posttest	PLPI (Raw Scores) Gain
Grand Total		216	$\bar{X}$	61.81	73.54	11.73	56.80	68.34	11.54	57.192	60.35	3.16
			SD	8.08	11.28		14.60	14.07		18.54	13.10	
ITA	Total	54	$\bar{X}$	60.32	71.39	11.07	56.61	65.11	8.50	57.54	53.22	-4.32
			SD	7.71	12.48		13.23	13.42		21.56	15.64	
	Boys	27	$\bar{X}$	61.52	74.18	12.66	61.74	70.48	8.74	56.74	56.44	- .30
			SD	8.20	11.81		14.04	12.57		22.63	14.29	
	Girls	27	$\bar{X}$	59.11	68.59	9.48	51.48	59.74	8.26	58.33	50.00	-8.33
			SD	7.13	12.72		10.25	12.20		20.83	16.52	
ITA plus PLDK	Total	54	$\bar{X}$	61.82	73.80	11.98	57.04	71.70	14.66	55.78	66.15	10.37
			SD	7.36	7.94		14.03	13.78		16.02	11.65	
	Boys	27	$\bar{X}$	62.11	74.57	12.46	57.00	75.44	18.44	59.96	64.33	4.37
			SD	6.17	7.60		14.86	14.91		12.12	12.62	
	Girls	27	$\bar{X}$	61.52	73.04	11.52	57.07	67.96	10.89	51.59	67.96	16.38
			SD	6.87	8.32		13.42	11.64		18.44	10.53	
PLDK	Total	54	$\bar{X}$	62.18	76.98	14.80	57.70	67.39	9.69	60.65	64.52	3.87
			SD	9.51	13.25		17.92			19.41	9.50	
	Boys	27	$\bar{X}$	63.93	78.70	14.77	62.89	70.70	7.81	57.78	63.00	5.22
			SD	10.73	13.23		18.89	14.16		19.75	7.10	
	Girls	27	$\bar{X}$	60.44	75.26	14.82	52.52	64.07	11.55	63.52	66.04	2.52
			SD	7.66	13.30		15.54	14.61		19.00	11.35	
Control	Total	54	$\bar{X}$	62.91	72.00	9.09	55.83	69.15	13.32	54.82	57.50	2.78
			SD	8.35	10.11		13.04			16.60	10.64	
	Boys	27	$\bar{X}$	61.52	69.52	8.00	53.78	69.33	15.55	53.82	55.70	1.88
			SD	8.12	10.21		16.83	14.17		16.56	10.92	

Table 6 - continued

Means and Standard Deviations for Language Data

Group	N		ITPA (LA) Pretest	ITPA (LA) Posttest	ITPA (LA) Gain	PPVT (MA) Pretest	PPVT (MA) Posttest	PPVT (MA) Gain	PLPI (Raw Scores) Pretest	PLPI (Raw Scores) Posttest	PLPI (Raw Scores) Gain
Girls	27	$\bar{X}$	64.30	74.48	10.18	57.89	68.96	11.07	55.82	59.30	3.48
		SD	8.49	9.55		12.63	14.03		16.89	10.25	

Table 6. Analyses of variance were carried out on these measures to determine i differences existed which could be accounted for by either sex, or one of the treatment programs. Results of these analyses are presented in Tables 7, 8, and 9. Table 7 indicates that the PLDK groups made significantly greater gains than the non-PLDK groups in language age as measured by the ITPA. Table 8 suggests th

Table 7

Analysis of Variance of Gains in Language Age as measured by Illinois Test of Psycholinguistic Abilities

Source of Variation	Degree of Freedom	Sum of Squares	Mean Squares	F Ratio	Confidence Levels
A (ITA vs non ITA)	1	1.196	1.196	1.192	$F_{.95}=3.89$**
B (PLDK vs non PLDK)	1	6.717	6.717	6.695**	$F_{.90}=2.73$*
C (Boys vs Girls)	1	.234	.234	.233	
AB interaction	1	.120	.120	.120	
AC interaction	1	2.170	2.170	2.163	
BC interaction	1	.062	.062	.062	
ABC interaction	1	.367	.367	.366	
Error	208	208.67	1.003		
Total	215	219.539			

treatments did not significantly differentiate among groups in terms of PPVT MA gains; thus, one cannot account for the significant interaction. Again in the PLPI post-test scores, the PLDK groups made significantly higher scores than the non-PLDK groups, with the significant AB interaction indicating that the PLDK in combination with ITA prevents a depreciation in post-test PLPI scores.

Table 8

Analysis of Variance of MA Gains as measured by

Peabody Picture Vocabulary Test

Source of Variation	Degree of Freedom	Sum of Squares	Mean Squares	F Ratio	Confidence Levels
A (ITA vs non ITA)	1	.375	.375	.003	$F_{.95}=3.89$**
B (PLDK vs non PLDK)	1	86.894	86.894	.594	$F_{.90}=2.73$*
C (Boys vs Girls)	1	260.042	260.042	1.779	
AB interaction	1	1295.560	1295.560	8.863**	
AC interaction	1	179.771	179.771	1.230	
BC interaction	1	4.448	4.448	.030	
ABC interaction	1	789.572	789.572	5.402**	
Error	208	30402.963	146.168		
Total	215	33019.625			

Measurement of intelligence was made by means of the Stanford-Binet. Pre-test, post-test, and gain scores are presented in Table 10. Analysis of variance results are reported in Table 11 only for IQ scores from the S-B, as the MA analysis yielded essentially identical results. The PLDK groups made significantly greater gain in IQ over the non-PLDK groups at the 0.90 but not at the 0.95 level of confidence. In addition, significant interactions were observed between experimental treatments, and between sex and ITA treatment. However, as shown by the AB interaction, this was primarily accounted for by the group receiving both ITA and PLDK treatments. In addition, an AC interaction was observed, indicating that IQ gains for ITA experimental treatment were greater for boys than girls, while the reverse was true for groups receiving PLDK. Said another way, children receiving PLDK plus ITA (gained 9.24 IQ points) made significantly greater progress than pupils on PLDK

Table 9

Analysis of Variance of PLPI Post Test

Raw Scores[1]

Source of Variation	Degree of Freedom	Sum of Squares	Mean Squares	F Ratio	Confidence Levels
A (ITA vs non ITA)	1	94.671	94.671	.658	$F_{.95}=3.89$**
B (PLDK vs non PLDK)	1	5370.041	5370.041	37.345**	$F_{.90}=2.73$*
C (Boys vs Girls)	1	49.115	49.115	.342	
AB interaction	1	471.116	471.116	3.276**	
AC interaction	1	301.042	301.042	2.094	
BC interaction	1	305.783	305.783	2.126	
ABC interaction	1	381.338			
Error	208	29909.852	143.797		
Total	215	36882.958			

alone (5.50 IQ points gain), ITA alone (4.34 IQ points gain), or controls (6.00 IQ points gain), with ITA in combination with PLDK facilitating for boys, but no more effective than PLDK alone for girls.

Discussion

It is apparent from the data that both ITA and PLDK show some potential for effectively altering the behavior of underprivileged children when instituted in the first grade essentially at the beginning of their school careers. (Less than ten of the subjects had received an academic year of kindergarten; however, approximately half had had a brief summer school experience). While the investigators recognize that the effectiveness of these procedures must ultimately be judged against the long-term performance of the group, some observations seem warranted on the basis of one year of study.

Table 10

Means and Standard Deviations for Intelligence Data on the 1960 Stanford Binet

Group		N		SB-IQ Pretest	SB-IQ Post test	SB-IQ Gain	SB-MA Pretest	SB-MA Post test	SB-MA Gain
Total		216	$\bar{X}$	84.55	90.89	6.34	65.22	77.51	12.27
			SD	11.32	12.47		8.04	9.33	
ITA	Total	54	$\bar{X}$	85.18	89.52	4.34	63.89	74.93	11.04
			SD	11.17	11.40		7.60	8.28	
	Boys	27	$\bar{X}$	86.93	92.67	5.74	64.78	77.07	12.29
			SD	10.56	11.32		7.45	8.63	
	Girls	27	$\bar{X}$	83.44	86.37	2.93	63.00	72.78	9.78
			SD	11.68	10.78		7.78	7.45	
ITA plus PLDK	Total	54	$\bar{X}$	85.35	94.59	9.24	65.33	79.72	14.39
			SD	9.66	11.19		6.61	7.56	
	Boys	27	$\bar{X}$	83.52	95.00	11.48	64.96	81.22	16.26
			SD	9.23	9.66		5.76	6.48	
	Girls	27	$\bar{X}$	87.18	94.18	7.00	65.70	78.22	12.52
			SD	9.89	12.72		7.46	8.36	
PLDK	Total	54	$\bar{X}$	82.70	88.50	5.80	67.11	78.94	11.83
			SD	13.82	14.27		10.44	10.83	
	Boys	27	$\bar{X}$	83.07	87.59	4.52	68.37	79.26	10.89
			SD	14.49	14.05		11.33	11.60	
	Girls	27	$\bar{X}$	82.33	89.41	7.08	65.85	78.63	12.78
			SD	13.38	14.70		9.51	10.21	
Control	Total	54	$\bar{X}$	84.94	90.94	6.00	64.54	76.45	11.91
			SD	10.30	12.26		6.76	9.67	
	Boys	27	$\bar{X}$	84.22	90.19	5.97	63.85	76.00	12.15
			SD	10.91	12.86		6.75	9.47	
	Girls	27	$\bar{X}$	85.67	91.70	6.03	65.22	76.89	11.67
			SD	9.80	11.81		6.83	10.04	

Table 11

Analysis of Variance of IQ gains as measured by Stanford Binet

Source of Variation	Degree of Freedom	Sum of Squares	Mean Squares	F Ratio	Confidence Levels
A (ITA vs non ITA)	1	42.667	42.667	.542	$F_{.95}=3.89$**
B (PLDK vs non PLDK)	1	298.685	298.685	3.788*	$F_{.90}=2.73$*
C (Boys vs Girls)	1	73.500	73.500	.932	
AB interaction	1	352.666	352.666	4.472**	
AC interaction	1	332.518	332.518	4.217**	
BC interaction	1	2.241	2.241	.028	
ABC interaction	1	58.075	58.075	.736	
Error	208	15778.296	75.857		
Total	215	16938.648			

School Achievement

As noted previously, a number of differences appear in the analysis of achievement data. Foremost among these is the finding that groups learning to read in ITA, with or without PLDK, performed much better than those who did not. Closely related to the major finding of the investigation was the observation that differences in performance were not equal for all subtests of the MAT. The ITA groups showed a superiority approaching one full grade on Word Discrimination which measures word attack skills. The differential was only about one-half year on word knowledge and reading comprehension for sentences. These are processes of reading which go beyond word attack. However, on all three reading subtests the differences were statistically significant between the ITA and non-ITA groups. Thus, it appears that the ITA program, while generally effective in stimulatory

reading ability, is particularly effective in terms of developing word attack skills. Since ITA involves modification of the reading program it was expected that the greatest effect of the program would be demonstrated on reading subtests. In fact, it was anticipated that teachers might slight their arithmetic program in favor of the interesting and innovative experimental reading program. It was gratifying to note that the arithmetic scores for the experimental and control groups were not significantly different. This would suggest that the institution of an experimental program in one subject area need not adversely effect other elements of the overall school program.

Another finding which requires interpretation relates to differences in performance based on the sex of the subjects. As was to be expected at the primary level, the academic performance of girls in the sample was slightly superior to that of the boys--significant at the .90 but not at the .95 level of confidence --a difference which was not as great as was anticipated from previous reading research. Further analysis revealed a significant interaction among PLDK participation, MAT subtest, and sex. Breakdown of this analysis indicated that the PLDK was generally more effective for boys than for girls in terms of school achievement on the word knowledge and word discrimination subtests. These results suggest that the PLDK, while it did not enhance the general academic performance of disadvantaged children after one year of schooling, did have a facilitating effect for boys on the two areas of reading. One might conjecture that this is associated with the amelioration of certain language deficits which are more pronounced in boys than girls at this age.

The scores of the ITA groups become even more heartening when it is recalled the mean IQ of the group at the beginning of the school year was 83, and the mean MA was 5-4. In terms of expectancy for school achievement, when measured by any formula which includes a measure of mental age, the experimental subjects did remarkably well. This performance is particularly gratifying in view of the

fact that the scores used in this analysis were from tests printed in traditional orthography which could be expected to place the ITA subjects at a disadvantage. [These subjects were subsequently retested with an alternate form of the MAT which had been transliterated into ITA. The scores demonstrated that the children in ITA did even better on this version. These data are not reported in this article but are available in the monograph (Dunn and Mueller, 1966)].

On the basis of the present study it then seems reasonable to conclude that the ITA clearly can be expected to accelerate learning to read for disadvantaged Grade 1 children. While such a strong conclusion cannot be reached in regard to the effectiveness of the PLDK on school achievement, the data do suggest that its use may facilitate acquisition of certain basic reading skills in boys from this group.

Language Development

An ultimate goal of the experimental programs is the enhancement of academic achievement. It is expected that the longitudinal study will further establish a positive relationship between language facility and school achievement. However, one goal of the initial phase of the project was the enhancement of language ability as an end in itself.

The primary evaluation of language growth in this investigation was based on LA gain scores from the ITPA. This analysis indicated that gains made by the groups receiving PLDK were significantly greater than gains made by non-PLDK groups. There was no significant interaction between treatments suggesting that the teachers can learn two new techniques (ITA and PLDK) simultaneously and effectively. This is consistent with the earlier observation that arithmetic growth did not appear to be adversely effected by competition with an experimental ITA program. Other findings include no significant differences in Language Age on the ITPA (1) for

subjects on ITA vs non-ITA, or (2) for boys vs girls. This latter result weakens the argument used to explain why boys appeared to profit more than girls on PLDK when viewed from progress in reading achievement. Finally, as expected, the controls made significantly less gains in LA than either those receiving PLDK plus ITA, and those receiving PLDK without ITA.

The gain scores on the PPVT are difficult to interpret. Furthermore, inspection of the pre-test PPVT data suggest that many subjects scored spuriously low on this instrument, probably because it was given as a warm-up device before rapport was established. But utilizing post-test data only did not lead to results that were any more clear-cut. Thus the data, as reported here, cannot be interpreted. They indicate that neither of the experimental treatment programs, taken alone or together, facilitated the acquisition of hearing vocabulary as measured by the PPVT. Certainly, the PLDK makes no major systematic attempt to extend the hearing vocabulary of children.

The analysis of gain scores on the PLPI were equally difficult to interpret. In collecting pre-test data, it was necessary to use a large number of minimally-trained examiners. By the time of post-testing, a small number of highly-trained examiners were available. Thus, it appeared desirable to evaluate post-test scores primarily. Here we have the anticipated main effect of the PLDK groups scoring significantly higher than the non-PLDK groups, with no difference directly attriutable to ITA training. However, the significant interaction between treatments suggests that the combination may be particularly facilitating for this aspect of language behavior.

In summary, it is fairly clear that experience with PLDK stimulates most aspects of language development. While it does not facilitate the acquisition of a hearing vocabulary, it does stimulate connected speech, and language reasoning.

Intelligence

The findings from the analysis of S-B scores also indicated more favorable gains for groups receiving PLDK than those which did not. Again, the interpretation was complicated by the occurrence of interaction. On the basis of these data, it does appear that ITA complements the PLDK program. It also appears that ITA experience in combination with PLDK has a striking effect on increases on MA and IQ for boys, but produces much smaller changes among girls.

Conclusions

On the basis of the results discussed here, it would be premature to draw any firm conclusions, both because of the relatively short treatment period and because of the apparent inconsistencies in the data. However, it is necessary to make an effort to pull together the information which was developed during the first year investigation. With reference to the ITA, this investigation strongly suggests that this program can enhance performance in beginning reading at least. The evidence further suggests the possibility that learning to read in this medium, when combined with PLDK, may have positive effects on performance in some aspects of general linguistic and intellectual development. The positive effects of the PLDK program are also rather apparent. The effect of this program on language ability as measured by the ITPA and PLPI was quite clear, but not for hearing vocabulary growth as measured by the PPVT. In addition, the results suggest that the PLDK may effectively increase some aspects of achievement at least for disadvantaged boys. Finally, the study suggests that measured intelligence is also enhanced by the PLDK.

Summary

The purpose of this study was to investigate, with underprivileged first grade children, the efficacy of the Initial Teaching Alphabet (ITA) in teaching

beginning reading, and of the Peabody Language Development Kit (PLDK) in stimulating oral language and verbal intelligence. From 17 classes in nine schools, four groups were constituted: (1) four teachers used ITA plus PLDK, (2) four used ITA without PLDK, (3) four used PLDK without ITA, and (4) control subjects. The groups consisted of 100, 104, 84, and 81 subjects respectively. Samples of 54 each were drawn from these groups such that they were comparable on chronological age, sex, IQ, level of education of the most-educated parent, number of members in the family, type of housing, and race.

The experimental programs were begun in September after the subjects were pre-tested. Both the PLDK and ITA were taught by the regular classroom teachers in self-contained classes. Post-testing was begun in late March and completed in mid-May. Therefore the treatments were 7-1/2 months in length. Controls were simply pre- and post-tested. The experimental teachers were given pre-service training on their experimental treatment(s), were provided a small salary supplement, had inservice sessions bi-weekly throughout the year, and were observed frequently. Thus, motivation to excellence in teaching among the experimental teachers was high. Too, even pre-testing the control children alerted their teachers that pupil progress was being monitored. Thus, the Hawthorn effect cannot be overlooked.

Pupil progress was measured in three areas: school achievement, language development, and intellectual growth. School achievement data from the Metropolitan Achievement Test in traditional orthography given only at the end of the year revealed the group learning to read in ITA (with or without PLDK) performed significantly better on all three reading sub-tests than subjects in a regular basic reading program, and that progress in word attack skills exceeded progress in reading comprehension. An interesting finding was that the boys approached the girls in reading, and that the PLDK in combination with ITA was more effective

for boys than girls in stimulating reading skills.

Language development was measured by pre- and post-testing with the Illinois Test of Psycholinguistic Abilities, the Peabody Picture Vocabulary Test, and the Peabody Language Production Inventory. The PLDK stimulated most aspects of language but did not markedly facilitate the acquisition of hearing vocabulary per se. The evidence is mixed on whether ITA and PLDK complement one another.

Intellectual growth was measured by the 1960 Stanford-Binet indicating that the PLDK groups made greater progress than the non-PLDK group, with ITA complementing the PLDK especially for boys.

Because of the relatively short treatment, the probability that the Hawthorn effect was operating to the advantage of both interventions, and some analyses (mainly double and triple interactions) which are difficult to interpret, it would be premature to draw firm conclusions. However, rather clearly ITA enhances beginning reading skills especially in word attack, and the PLDK does raise the IQ and facilitate overall oral language facility, as well as reading skills for disadvantaged boys. It will remain for later reports to indicate the permanence of the effects, and for additional studies to determine what role the Hawthorn effect was playing in the results.

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